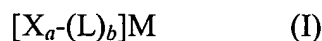


WHAT IS CLAIMED IS:

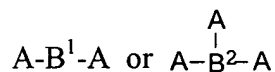
1. An organic light emitting device comprising an anode, a cathode, and an organic layer disposed between the anode and the cathode, wherein the organic layer comprises a phosphorescent organometallic emissive material comprising a transition metal, and two or three bidentate ligands, wherein two or more of the bidentate ligands are covalently linked by a linking group, wherein, the bidentate ligands are selected from
bidentate photoactive ligands, wherein each bidentate photoactive ligand is bound to the transition metal through a carbon-metal bond and a nitrogen-metal bond to form a cyclometallated ring, and
bidentate ancillary ligands,
wherein at least one of the bidentate ligands is a bidentate photoactive ligand.
2. The organic light emitting device of claim 1, wherein the linking group provides no π -conjugation between the linked bidentate ligands.
3. An organic light emitting device comprising an anode, a cathode, and an organic layer disposed between the anode and the cathode, wherein the organic layer comprises an emissive material having the formula I



wherein,

M is a transition metal having a molecular weight greater than 40;

X is a linking group that links two or more L, and is selected from the group consisting of $-(CR_2)_d-$, $-[O(CR_2)_e]O-$, or a group having the formula



wherein

A is $-(CR_2)_f-$, or $-Z-(CR_2)_g-$;

Z is $-O-$, $-NR-$, or $-SiR_2-$;

B^1 is $-O-$, $-NR-$, $-CR=CR-$, aryl, heteroaryl, cycloalkyl, or a heterocyclic group,

B^2 is $-\overset{|}{N}-$, $-\overset{|}{CR}-$, alkyl, aryl, heteroaryl, cycloalkyl, or a heterocyclic group;

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,

d is 1 to 6,

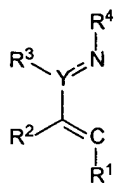
e is 1 to 6,

f is 1 to 4, and

g is 1 to 4;

L is a bidentate ligand selected from the group consisting of

(i) bidentate photoactive ligands having the formula II



(II)

wherein

the bidentate photoactive ligand is bound to the transition metal through a carbon-metal bond and a nitrogen-metal bond to form a cyclometallated ring,

Y is N or C,

the dotted line represents an optional double bond,

R^1 , R^2 , R^3 and R^4 are independently selected from H, alkyl, or aryl, and additionally or alternatively, one or more of R^1 and R^2 , R^2 and R^3 , and R^3 and R^4 together from independently a 5 or 6-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents Z;

each substituent Z is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two Z groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group, and

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl; and

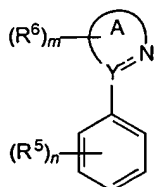
(ii) bidentate ancillary ligands,

a is 1 to 4;

b is 2 or 3; and

at least one L is selected from a bidentate photoactive ligand.

4. The organic light emitting device of claim 3, wherein the photoactive ligands are selected from compounds of the formula IV



(IV)

wherein:

ring A is an aromatic heterocyclic ring or a fused aromatic heterocyclic ring with at least one nitrogen atom that coordinates to the metal M,

Y is selected from carbon or nitrogen,

each R^5 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^5 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,

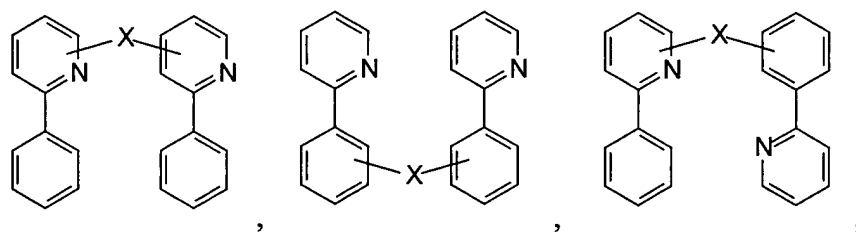
each R^6 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^6 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,

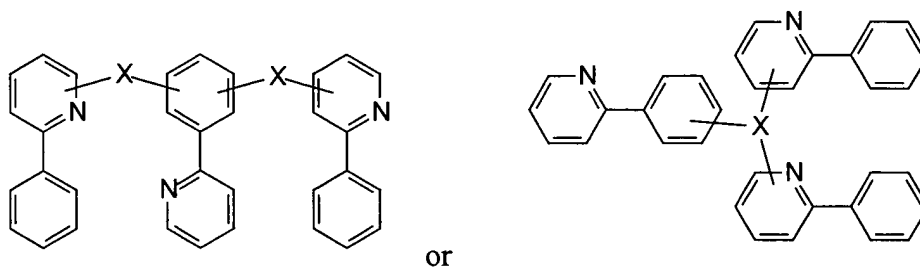
each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,

n is 0 to 4, and

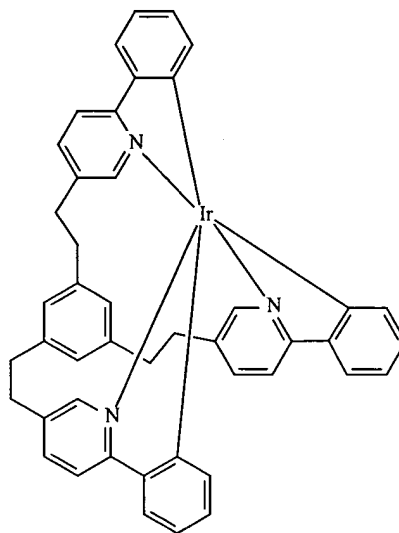
m is 0 to 4.

5. The organic light emitting device of claim 3, wherein $[X_a-(L)_b]$ has the formula:

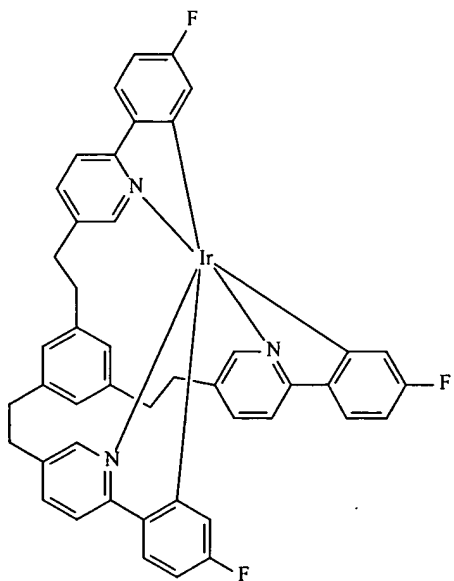




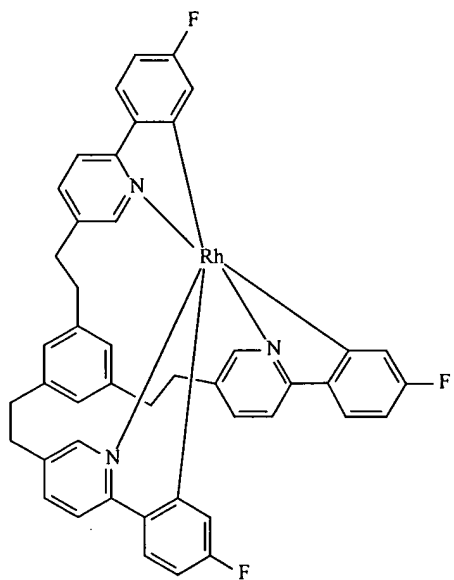
6. The organic light emitting device of claim 3, wherein the emissive material is a compound having the formula



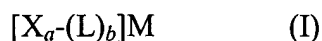
7. The organic light emitting device of claim 3, wherein the emissive material is a compound having the formula



8. The organic light emitting device of claim 3, wherein the emissive material is a compound having the formula



9. A compound of the formula I

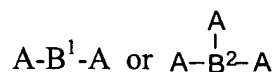


wherein,

M is a transition metal having a molecular weight greater than 40;

X is a linking group that links two or more L, and is selected from the group consisting of

$-(CR_2)_d-$, $-[O(CR_2)_e]O-$, or a group having the formula



wherein

A is $-(CR_2)_f-$, or $-Z-(CR_2)_g-$;

Z is $-O-$, $-NR-$, or $-SiR_2-$;

B^1 is $-O-$, $-NR-$, $-CR=CR-$, aryl, heteroaryl, cycloalkyl, or a heterocyclic group,

B^2 is $-\overset{\overset{|}{N}}{-}$, $-\overset{\overset{|}{CR}}{-}$, alkyl, aryl, heteroaryl, cycloalkyl, or a heterocyclic group;

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,

d is 1 to 6,

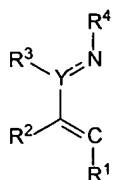
e is 1 to 6,

f is 1 to 4, and

g is 1 to 4;

L is a bidentate ligand selected from the group consisting of

(i) bidentate photoactive ligands having the formula II



(II)

wherein

the bidentate photoactive ligand is bound to the transition metal through a carbon-metal bond and a nitrogen-metal bond to form a cyclometallated ring,

Y is N or C,

the dotted line represents an optional double bond,

R^1 , R^2 , R^3 and R^4 are independently selected from H, alkyl, or aryl, and additionally or alternatively, one or more of R^1 and R^2 , R^2 and R^3 , and R^3 and R^4 together from independently a 5 or 6-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents Z;

each substituent Z is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two Z groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group, and

(ii) bidentate ancillary ligands,

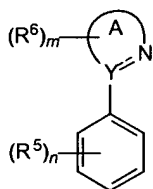
each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl;

a is 1 to 4;

b is 2 or 3; and

at least one L is selected from a bidentate photoactive ligand.

10. The compound of claim 9, wherein the photoactive ligands are selected from compounds of the formula IV



(IV)

wherein:

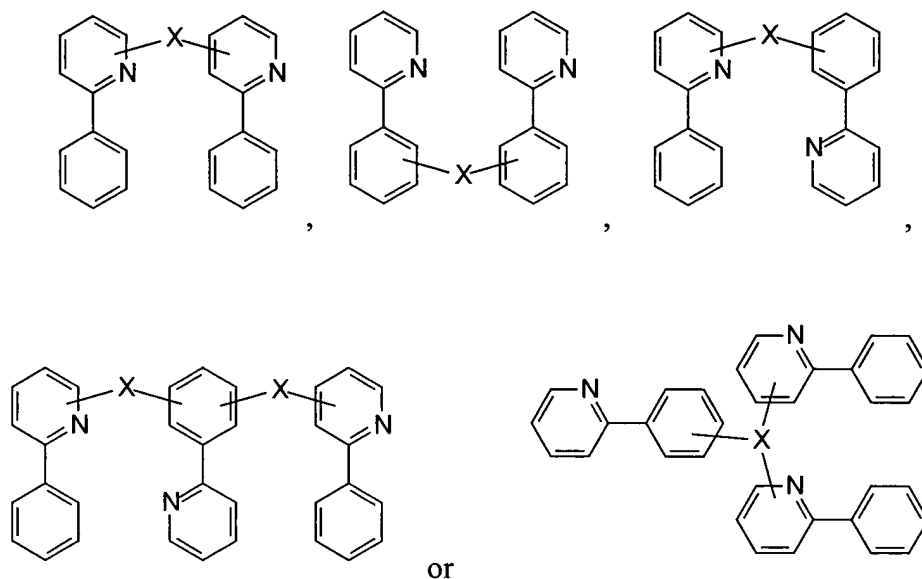
ring A is an aromatic heterocyclic ring or a fused aromatic heterocyclic ring with at least one nitrogen atom that coordinates to the metal M,

Y is selected from carbon or nitrogen,

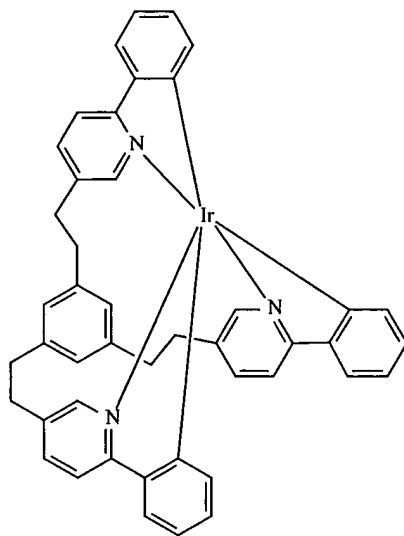
each R^5 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^5 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,

each R^6 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^6 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,
each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,
n is 0 to 4, and
m is 0 to 4.

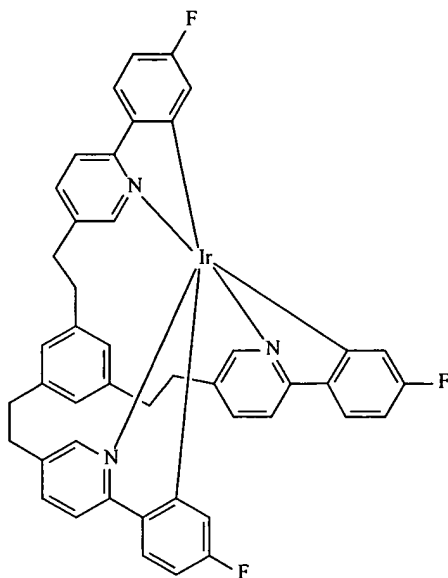
11. The compound of claim 9, wherein $[X_a(L)_b]$ has the formula:



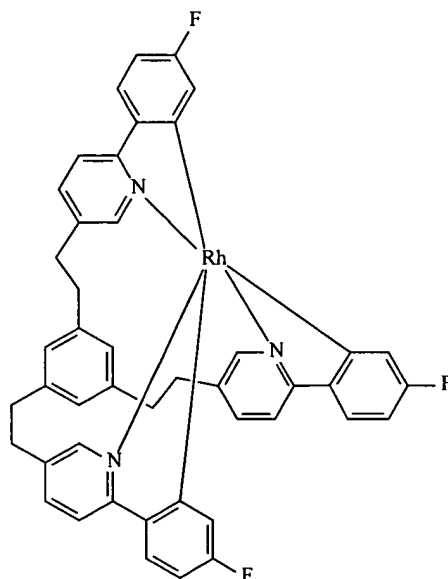
12. The compound of claim 9, having the formula



13. The compound of claim 9, having the formula



14. The compound of claim 9, having the formula

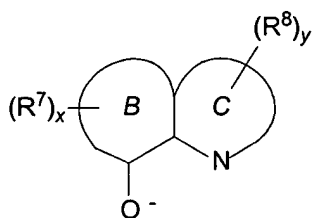


15. An organic light emitting device comprising an anode, a cathode, and an organic layer disposed between the anode and the cathode, wherein the organic layer comprises a material of the formula VII



wherein

Q is a bidentate ligand of the formula VIII



(VIII)

wherein

ring B is a 5- or 6-membered aromatic group,

ring C is a 5- or 6-membered aromatic heterocyclic ring with at least one nitrogen atom that coordinates to the Al,

each R^7 is independently selected from the group consisting of alkyl, alkenyl, alkynyl,

aralkyl, CN, CF₃, NR₂, NO₂, OR, halo, and aryl, and additionally, or alternatively, two R⁷ groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,

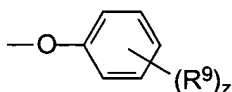
each R⁸ is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF₃, NR₂, NO₂, OR, halo, and aryl, and additionally, or alternatively, two R⁸ groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,

x is 0 to 3, and

y is 0 to 3;

J is selected from monodentate ligands having the formula



wherein each R⁹ is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF₃, NO₂, O-alkyl, halo, and aryl, and *z* is 0 to 5;

X is a linking group that links two or more of the ligands Q or J, wherein at least one of the ligands linked by the linking group X is a bidentate ligand Q;

h is 2 or 3;

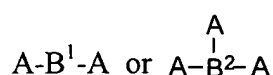
i is 1 to 4; and

j is 0 to 2.

16. The organic light emitting device of claim 15, wherein the linking group provides no π -conjugation between the linked bidentate ligands.

17. The organic light emitting device of claim 15, wherein the linking group X is selected from the group consisting of

-(CR₂)_{*d*}-, -[O(CR₂)_{*e*}]O-, or a group having the formula



wherein

A is $-(\text{CR}_2)_f$, or $-\text{Z}-(\text{CR}_2)_g$;

Z is $-\text{O}-$, $-\text{NR}-$, or $-\text{SiR}_2-$;

B^1 is $-\text{O}-$, $-\text{NR}-$, $-\text{CR}=\text{CR}-$, aryl, heteroaryl, cycloalkyl, or a heterocyclic group,

B^2 is $-\text{N}-$, $-\text{CR}-$, alkyl, aryl, heteroaryl, cycloalkyl, or a heterocyclic group;

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,

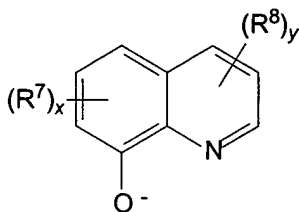
d is 1 to 6,

e is 1 to 6,

f is 1 to 4, and

g is 1 to 4.

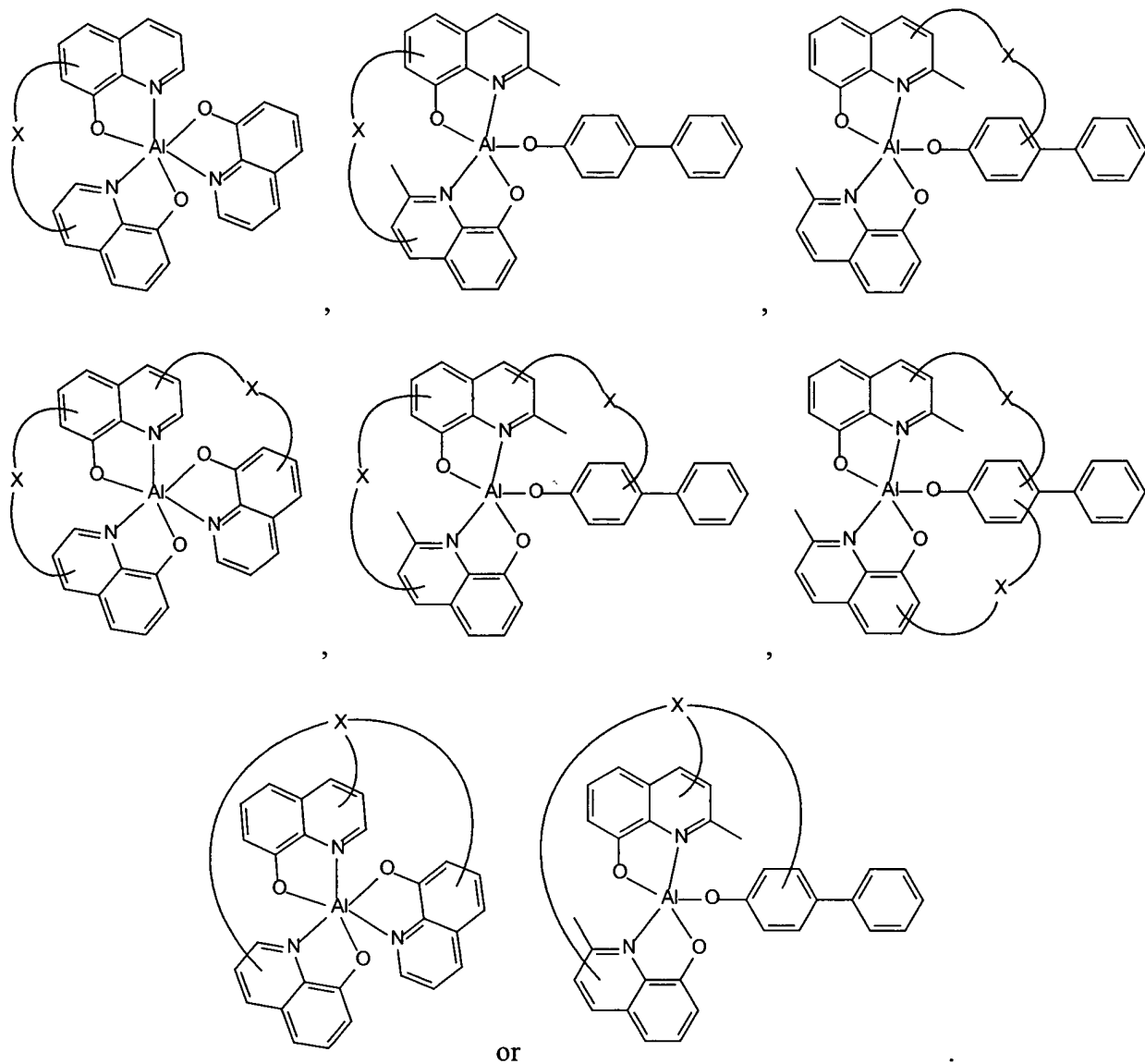
18. The organic light emitting device of claim 15, wherein the bidentate ligand Q has the formula



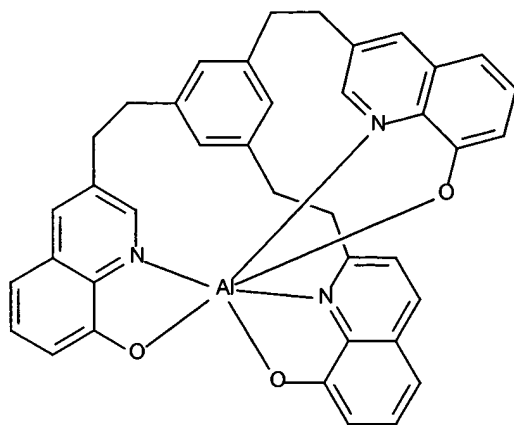
19. The organic light emitting device of claim 15, wherein j is 0 and h is 3.

20. The organic light emitting device of claim 15, wherein j is 1 and h is 2.

21. The organic light emitting device of claim 15, wherein $[\text{Q}_h(\text{X})_j\text{J}_j]$ has the formula



22. The organic light emitting device of claim 15, wherein the organic layer comprises a material of the formula

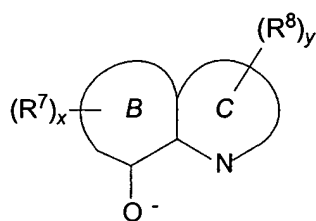


23. A compound of the formula VII



wherein

Q is a bidentate ligand of the formula VIII



(VIII)

wherein

ring B is a 5- or 6-membered aromatic group,

ring C is a 5- or 6-membered aromatic heterocyclic ring with at least one nitrogen atom that coordinates to the Al,

each R^7 is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF_3 , NR_2 , NO_2 , OR, halo, and aryl, and additionally, or alternatively, two R^7 groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,

each R^8 is independently selected from the group consisting of alkyl, alkenyl, alkynyl,

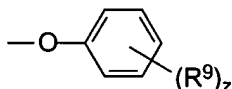
aralkyl, CN, CF₃, NR₂, NO₂, OR, halo, and aryl, and additionally, or alternatively, two R⁸ groups on adjacent ring atoms form a fused 5- or 6-membered aromatic group,

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,

x is 0 to 3, and

y is 0 to 3;

J is a monodentate ligands having the formula



wherein each R⁹ is independently selected from the group consisting of alkyl, alkenyl, alkynyl, aralkyl, CN, CF₃, NO₂, O-alkyl, halo, and aryl, and *z* is 0 to 5;

X is a linking group that links two or more of the ligands Q or J wherein at least one of the ligands linked by the linking group X is a bidentate ligand Q;

h is 2 or 3;

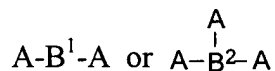
i is 1 to 4; and

j is 0 to 2.

24. The compound of claim 23, wherein the linking group provides no π -conjugation between the linked bidentate ligands.

25. The compound of claim 23, wherein the linking group X is selected from the group consisting of

-(CR₂)_{*d*}-, -[O(CR₂)_{*e*}]O-, or a group having the formula



wherein

A is -(CR₂)_{*f*}-, or -Z-(CR₂)_{*g*}-;

Z is -O-, -NR-, or -SiR₂-;

B¹ is -O-, -NR-, -CR=CR-, aryl, heteroaryl, cycloalkyl, or a heterocyclic group,

B^2 is $-\overset{|}{N}-$, $-\overset{|}{CR}-$, alkyl, aryl, heteroaryl, cycloalkyl, or a heterocyclic group;

each R is independently selected from H, alkyl, aralkyl, aryl and heteroaryl,

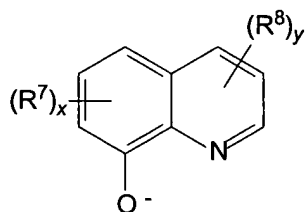
d is 1 to 6,

e is 1 to 6,

f is 1 to 4, and

g is 1 to 4.

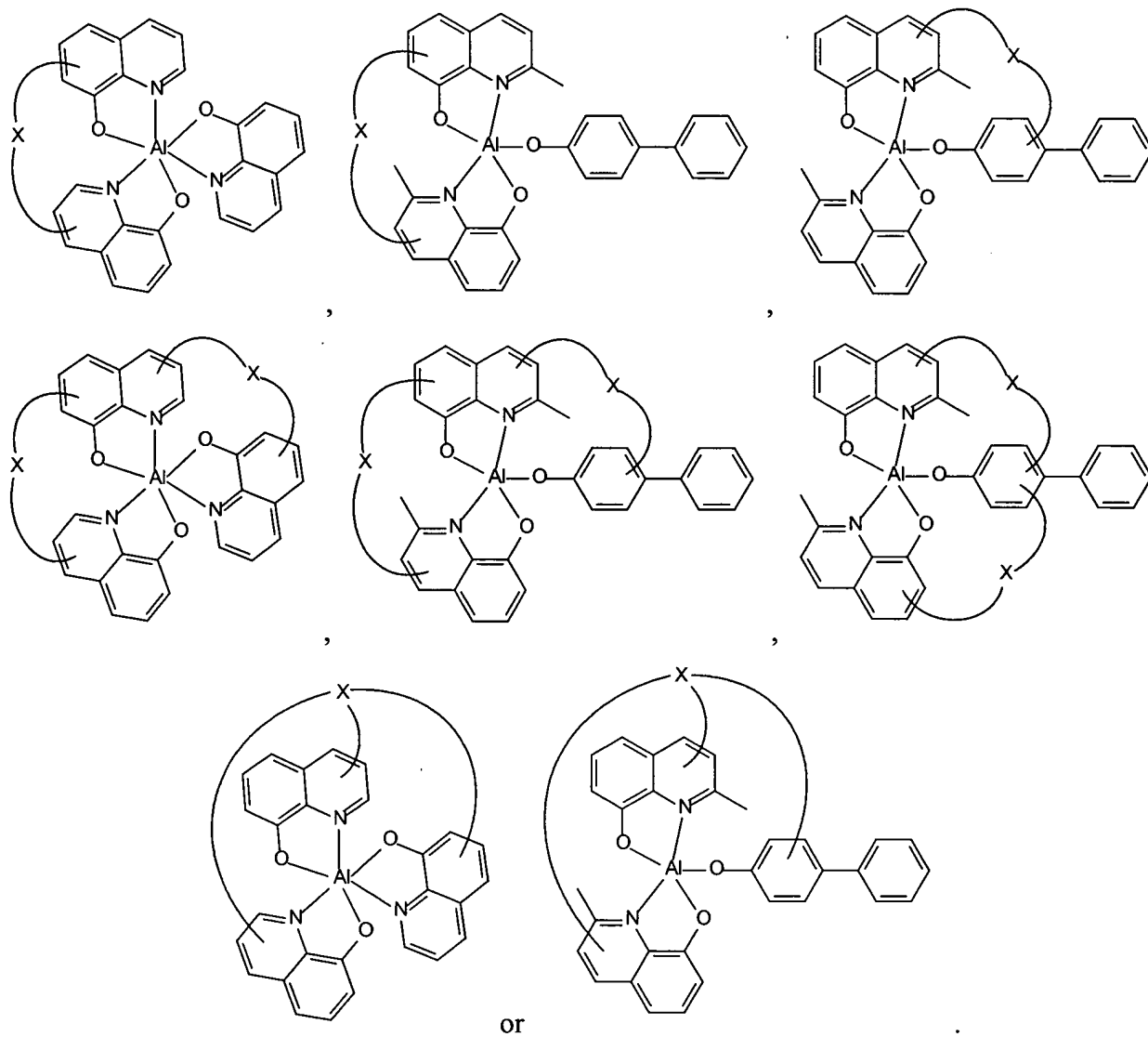
26. The compound of claim 23, wherein the bidentate ligand Q has the formula



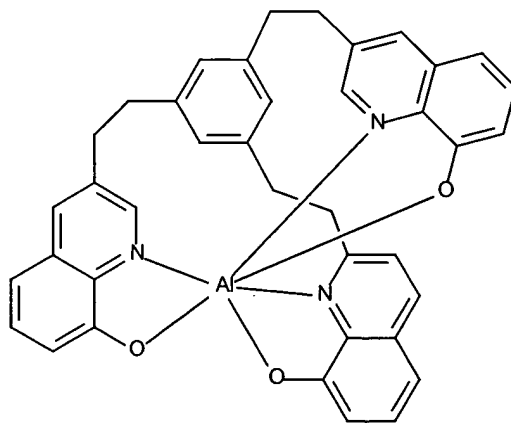
27. The compound of claim 23, wherein j is 0 and h is 3.

28. The compound of claim 23, wherein j is 1 and h is 2.

29. The compound of claim 23, wherein $[Q_h(X)_iJ_j]$ has the formula



30. The compound of claim 23, having the formula



31. An organic light emitting device comprising an anode, a cathode, and an organic layer disposed between the anode and the cathode, wherein the organic layer comprises a metal complex comprising:
- a metal;
 - a first ligand bound to the metal, wherein the first ligand is a bidentate ligand;
 - a second ligand bound to the metal; and
 - a linking group that covalently links the first ligand and the second ligand,
- wherein the linking group provides no π -conjugation between the first ligand and the second ligand.
32. The organic light emitting device of claim 31, wherein the metal complex is a phosphorescent organometallic emissive material.
33. The organic light emitting device of claim 31, wherein the metal complex further comprises an additional bidentate ligand.
34. The organic light emitting device of claim 31, wherein the second ligand is a bidentate ligand.
35. The organic light emitting device of claim 31, wherein the second ligand is a monodentate ligand.
36. The organic light emitting device of claim 31, wherein the metal is aluminum.